Chapter 5

The Air Medical Escort

The air medical escort must be able to provide high levels of emergency care in a challenging work environment. This chapter examines the physical factors that can affect the air medical escort and which may prevent a medical provider from working in the air medical environment. It also offers suggestions about appropriate clothing that air medical escorts might wear on flights.

Learning Objectives

Upon completion of this chapter, the participant should be able to:

- List eight physical factors to consider when deciding to be an air medical escort.
- Describe two common problems encountered by air medical escorts and two possible solutions to each problem.
- Describe five qualities that clothing should have when worn by air medical escorts.
- List one advantage and one disadvantage for five different materials that can be used in clothing for air medical escorts.
- List two types of personal flotation devices (PFDs) that may be found on aircraft.
- Describe two qualities footwear should have for air medical escorts.

General Considerations for Air Medical Escorts

As an air medical escort, it is important to be healthy. Annual physical exams can alert air medical escorts to potential medical problems. Chronic diseases, like anemia or pulmonary deficiencies, make it hard to perform the duties of an air medical escort. People with chronic diseases should consult their physician before working on air medical aircraft.

Physical strength and fitness also are important in air medical work. Air medical escorts must be able to direct and assist the movement of patients on and off the aircraft. Loading and unloading litter patients involve lifting at heights and angles not often encountered in either hospital or ground ambulance care. During air medical flights, medical escorts help patients move into more comfortable positions, perform reassessments, and provide medical treatment as needed.

Physical Factors to Consider

Listed below are ten physical factors people should consider when deciding whether to become a air medical escort. Escorts also should consider these factors when deciding whether or not to take a certain flight.

1. Weight of the Air Medical Escort

In small aircraft, weight can influence:

- Payload limits.
- Structural stresses.
- Aircraft balance as people move around in the cabin.
- The amount of fuel that can be carried and therefore flight range.

Patient care in the confined space of small aircraft requires agility. In a larger aircraft this may be less of a concern. People who can perform the duties of an air medical escort in a commercial jet may lack sufficient agility to provide patient care in smaller aircraft. This

consideration is especially relevant for people who are above standard weight.

2. Motion Sickness

Even fit, healthy, flight veterans feel motion sick sometimes. Air medical escorts should not be prone to air sickness. There are circumstances, however, under which anyone may feel motion sickness.

The best strategy for dealing with motion sickness is prevention. Air medical escorts should eat regular, light meals and stay hydrated while on-call waiting for flights. During flights, the following actions can minimize their chances of getting airsick and reduce symptoms of motion sickness:

- Keep the cabin air cool, not cold.
- Look out the windows of the aircraft occasionally.

Treatment for motion sickness may be different for patients and escorts because air medical escorts must stay awake during the flight but patients can sleep. Some anti-motion sickness drugs are Dramamine® Bonine® and Calm X®. Most of these drugs cause side effects such as:

- Dry mouth.
- Poor coordination.
- Drowsiness.
- Can interfere with escorts' abilities to care for their patients.

Air medical escorts need to have an idea of how they react to motion sickness medications before they use them in flight. Many flight services have policies restricting the use of medications that can negatively affect judgment or cause drowsiness.

If these medications are used, they must be taken before the onset of nausea to be effective.

Some other alternatives to prevent/treat airsickness:

- Acupressure. Acupressure is a therapy for airsickness used by some air medical escorts. It does not have the side effects

that medications have. Pressure is applied to a specific spot on the wrist to control nausea. Some drugstores and mail order catalogs sell elastic bands with a plastic disk that can be positioned over the anti-nausea acupressure point (e.g. Sea Band®). These can be worn for hours without side effects or discomfort.

- Ginger. Another therapy used by some air medical escorts is ginger tablets. These tablets can be purchased at a health food store or in the health food section of the local grocery store. It is suggested that people take one to two tablets two to four hours before the flight and every four hours after that.

Gingersnaps also may settle a queasy stomach. However, "eating in work areas where there is a reasonable likelihood of occupational exposure to blood" is prohibited by OHSA regulations.[1]

3. Effects of Noise on Hearing in the Air Medical Escort

Exposure to the high noise levels found in aviation is a serious threat to air medical escorts. Repeated exposure to noise can cause permanent hearing loss.[2] Usually this hearing loss is insidious and is discovered after years of exposure to noise. To understand how this occurs, it is important to understand how the human ear works. Sound waves travel from the source of the sound to the ear. Once in the ear they travel through:

- **The external ear** is the visible part of the ear and the external auditory canal, which ends at the eardrum. Sound travels through the air in this part of the ear and causes movement of the eardrum.

- **The middle ear** lies between the external and inner ear. It is an air-filled chamber with three small bones (ossicles) that link the eardrum to the inner ear. Movement of the eardrum causes the ossicles to move and transmit sound to the inner ear. The eustachian tube connects the middle ear with the nasopharynx and permits drainage and ventilation of the middle ear. It allows people to equalize the pressure between the outside air and the middle ear when flying or diving.

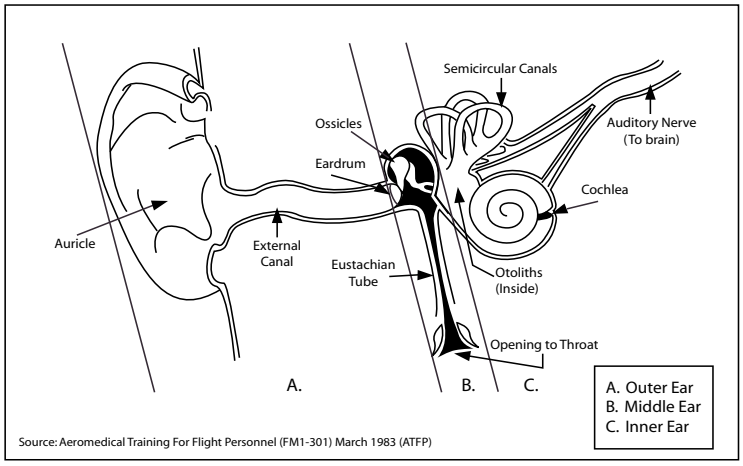
- **The inner ear** lies deep within the temporal bone and consists of an auditory section (for hearing) and a vestibular section (for balance). The auditory portion, known as the cochlea, is a snail-shaped fluid-filled chamber. This chamber has many small hair-

[1]29 CFR Part 1910.1030 *Occupational Exposure to Bloodborne Pathogens*; Final Rule (c) (2) (ix) January 18, 2001.

[2]*United States Air Force Flight Surgeons Guide*, Chapter 7, "Noise, Audiometry, and Communication," revised by Don Reeves, MD., MPH.

like receptors. Movement of the bones in the middle ear causes movement in the fluid, which stimulates the hair receptors. A signal is transmitted from the receptors in the cochlea to the brain, where the sound is interpreted.

The drawing below illustrates the parts of the ear.



Hearing loss from exposure to noise can be temporary or permanent.

- Loud sounds may fatigue the receptor cells in the cochlea so it takes several hours of relative quiet before they can revert to their normal state.

- Hair cells are grouped into bundles, which detect a specific frequency. When hair cells in the various bundles are destroyed there is a loss of hearing in that frequency range. Once these hair cells are destroyed, they are not replaced and the hearing loss is permanent.

According to the Occupational Safety and Health Administration (OSHA) noise standard, no employee is to be exposed to the equivalent of a constant sound pressure level of 90 decibels (dB) for more than eight hours, or the equivalent of a constant sound pressure level of 95 dB for more than four hours. The permitted time of exposure decreases as the volume in the environment increases. The noise level in the cabin of a commercial jet aircraft is generally 79–80 dB.[3] Sound levels in other aircraft vary depending on the:

- Number of engines.

[3]*United States Air Force Flight Surgeons Guide*, Chapter 7, "Noise, Audiometry, and Communication," revised by Don Reeves, MD., MPH.

- Type of engine/s.
- Location of the engine/s on the aircraft (e.g. wing versus fuselage mounting).
- Location of the passengers within the cabin.
- Phase of the flight (e.g. landing, takeoff, level flight).

A single exposure to the sounds common in aviation is not likely to cause permanent hearing loss in an adult. Since repetitive exposure to aviation noise may cause permanent hearing loss, air medical escorts should consider using hearing protection, even if it is not required by law. Hearing protection is more important if the air medical escort already has a hearing loss or is more susceptible to hearing damage for some reason.

4. Barotrauma—the Effects of Flight on the Ears, Sinuses and other Gas Filled Structures

Boyle's Law states that gas expands on ascent, and contracts on descent. Therefore, trapped or partially trapped gases within body cavities (e.g. the middle ear and sinuses) expand in direct proportion to the decrease in pressure (when elevation increases).

The United States Air Force studied the incidence of barotrauma during flight operations in their altitude chamber. The four most common problems included:

- Barotitis—inflammation in the middle ear caused by air being trapped in, or unable to enter the middle ear through the eustation tubes. Almost two-thirds of all the negative reactions involved the ears. In severe cases this can lead to perforation of the eardrum.
- Abdominal Gas—causing abdominal pain. This was the second most common complaint. It will be discussed later in the chapter.
- Barosinusitis—inflammation of the sinuses. It is the third most common reaction.[4] This is inflammation of the sinuses.
- Barodontalgia—This is a toothache caused by exposure to changing pressure. This generally affects teeth with underlying pulp disease. Air medical escorts should receive routine dental care to prevent this from occurring.

[4]W. J. McQueen, J. Santiago-Marini, *USAF Flight Surgeon's Manual*, Chapter 6, "The Otolaryngologic Aspects of Aerospace Medicine" (Internet) wwwsam.brooks.af.mil/af/files/fsguide/HTML/Chapter_06.html (sic).

Air medical escorts who have sinus problems, acute upper respiratory problems, or allergies are at increased risk for barotrauma. Flying with congested lungs puts escorts at risk for hypoxia and impaired judgment. Air medical crewmembers with upper respiratory infections should not fly.

5. Medications

Some confusion exists in the air medical community about what medications are permitted and not permitted by the FAA for pilots. The Civil Aerospace Medical Institute (CAMI) is the medical certification, research, and education wing of the United States Department of Transportation, Federal Aviation Administration's Office of Aerospace Medicine. CAMI maintains a list of prescription medications which can not be used by pilots. This list is updated frequently, so doctors who certify the health of pilots are encouraged to check this list often. The list contains only prescription medications, but pilots should wait 24 hours after taking medications that contain alcohol (e.g. Nyquil® or some cough medications) or that are known to impair judgment or cause drowsiness before they fly.

Caffeine and some medications, both prescription and over-the-counter, may impair physical and mental performance at higher altitudes. Care should be taken by air medical escorts to avoid taking these medications before flying.

6. Anemia

FAA Flight Standards Order 4040-9C (1985) states "pilots should not fly within 24 hours of donating over a half a pint of blood." Loss of blood increases the potential for anemic hypoxia. Air medical escorts also may want to wait more than 24 hours after a blood donation before flying air medical flights.

7. Alcohol

The Federal Aviation Regulations (FAR) guidelines of alcohol are in 14 CFR–Chapter I–Part 91.17. They state:

> "(a) No person may act or attempt to act as a crewmember of a civil aircraft—
>
> (1) Within 8 hours after the consumption of any alcohol beverage;

(2) While under the influence of alcohol;

(3) While using any drug that affects the person's faculties in any way contrary to safety; or

(4) While having 0.04 percent by weight or more alcohol in the blood…"[5]

Many commercial airlines have a twenty-four hour rule for their pilots. Local organizations may have more stringent guidelines.

8. Food/Gastrointestinal Changes

Gas contained within body cavities is saturated with water vapor. Water vapor is non-compressible, which means wet gases expand more than dry gases. The stomach and intestines normally contain gas at a pressure about the same as the surrounding barometric pressure. On ascending to a higher altitude, however, the gases in the GI tract expand and, unless passed, can produce pain and discomfort, make breathing more difficult, and possibly lead to hyperventilation or syncope. Severe pain may cause a vasovagal reaction with hypotension, tachycardia, and fainting.

Eating a large meal immediately before a flight increases the likelihood of motion sickness. Gas production in the intestines increases with:

- Eating foods such as onions, cabbage, apples, radishes, cucumbers, melons, and beans.
- Drinking carbonated beverages.
- Chewing gum (which causes air swallowing).
- Eating irregularly or quickly.

The risk of symptoms from trapped gas increases as cabin altitude increases (Boyle's Law).

9. Immunizations

Health care workers, including air medical escorts are at risk for contact exposure, respiratory exposure and needle sticks. The Advisory Committee on Immunization Practices (ACIP) published its recommendations for Immunization in Health-Care Workers.[6] This organization strongly recommends vaccines against the following:

[5]www.access.gpo.gov/nara/cfr/cfrhtml_00/Title_14/14cfr91_00.html

- Hepatitis B
- Influenza
- Measles
- Mumps
- Rubella
- Varicella

OSHA requires employers to offer hepatitis B vaccine to all employees.[7] TB screening must be done periodically.

Hepatitis A is not considered to be an occupationally acquired disease, and therefore, is not included in the recommendations for health-care workers.

10. Stresses of Flight

The stresses of flight described in Chapter 6 affect air medical escorts as well as patients. Many of the stresses of flight combine to cause mental and physical fatigue. This can lead to:

- Decreased concentration and reaction time.
- More mistakes.
- Becoming preoccupied with a single task at the exclusion of other important parts of patient care.
- Being less aware of problems with air medical escort performance.
- Being less able to attend to detail and notice small changes in patient behavior.
- Trouble with memory, especially short-term memory.

In addition to aviation stresses, other stresses include:

- Work-related stress associated with on-call schedules.

[6]"Immunization of Health-Care Workers: Recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Hospital Infection Control Practices Advisory Committee (HICPAC)" MMWR Recommendations and Reports December 26, 1997 / 46(RR-18), pp. 1–42.

[7]29 CFR Part 1910.1030 *Occupational Exposure to Bloodborne Pathogens*; Final Rule (f) (1) (i) January 18, 2001.

- Shift work that interferes with the escort's circadian rhythm.
- The physical demands of loading and unloading the patient and providing medical care in the air medical environment.

To stay alert, escorts should:

- Drink enough fluids.
- Eat regular meals and snack when appropriate.
- Bring something to keep their minds active to stay alert.

Other Considerations for the Escort

Clothing

Dressing

Dressing appropriately is a challenge for the air medical escort in Alaska. Clothing must be:

- Safe.
- Warm.
- Look professional and neat.
- Practical and comfortable.
- Loose and comfortable so air medical escorts can move around in the confined space of aircraft.

Environment

Air medical escorts should consider the:

- Weather at the sending and receiving locations.
- Terrain over which they are flying.

Materials

There are many stores, catalogs, and Internet sites that sell arctic winter gear, survival equipment, and aviation clothing/flight suits. In the larger cities there are stores that offer many different types of outdoor clothing. Some of the newer equipment and fabrics are expensive.

Nomex® is an example of a non-flammable material recommended for flight personnel.

- It does not melt like other fabrics, and therefore is a safer material in a crash landing with fire.
- It is not very warm, and is not considered winter wear for arctic conditions.
- Nomex® clothing comes pre-made in flight suits, long underwear and insulated coveralls.
- Underwear should be made of natural fibers like cotton, wool or silk. A quarter-inch air space between layers increases protection in fires.

Natural fibers do not provide fire protection, but fare better when exposed to flame than most synthetic fibers.

- Wool insulates well and continues to insulate when it is wet, but it can be very heavy.
- Down insulates well and is very lightweight, but loses its insultating capacity when wet.
- Cotton is comfortable and absorbs moisture, but can lead to hypothermia if it gets wet in a cool or cold environment.

Various hollow synthetic fibers such as Capolene®, polypropylene and Thermax® are good insulators when dry and when wet.

- They are lightweight and tend to be less bulky.
- They do not offer any protection from fire; they are very flammable and may melt to the skin if exposed to flame.

Some of the new arctic outfits (e.g. Northern Outfitters®) are effective in very cold conditions, but tend to be big, bulky and expensive.

Flotation

Some helicopter air medical services require escorts to wear flotation equipment when flying over water. Types of personal flotation devices (PFDs) used include:

- Vests with CO_2 canisters that can be inflated after exiting the aircraft.
- Flotation coveralls like the Mustang Suit® which can be specially made from Nomex®.

Just as medical procedures are practiced in drills, air medical escorts should practice using the specific flotation devices provided by their flight service. Helicopter egress (including underwater helicopter escape simulations) and survival training give escorts hands-on knowledge of their equipment before they have to use it. Training also teaches them procedures to follow in a survival situation. Survival training is best when air medical escorts use the same uniform and equipment as they use on regular flights, including helmets and flotation equipment.

Footwear

Footwear should be adequate for use in the terrain over which the aircraft will be flying. It also should provide enough support when moving patients. The Commission of Accreditation of Medical Transport Systems (CAMTS) standards require boots or sturdy footwear for on-scene operations.[8] A boot with good treads that will grip on icy runways is the best choice. Ice grippers can be added to footwear with poor treads, but may damage aircraft floors if worn in the aircraft. **Sneakers or similar types of light footwear are not appropriate for air medical transport.**

Listed below are descriptions and some advantages and disadvantages of commonly used cold weather boots.

Bunny Boots

- Rated to –50° to –60°F.
- Bulky and heavy.
- Waterproof, but feet sweat.
- Lack versatility.
- May be slippery on icy surfaces.

[8]Commission of Accreditation of Medical Transport Systems (CAMTS) *Accreditation Standard*, 5th edition, January 2002, Standard 02.04.04 p. 6 and Standard 35.04.01 p. 73.

Sorel®-type boots

- Rating varies with boot and can go down to –60°F.
- Somewhat less bulky and lighter than Bunny boots, but heavier than most hiking boots.
- Waterproof to ankle, has replaceable liners, and extra liners can be taken along.
- Traction varies with the boot, from fair to good.

Leather hiking boots

- Not for extreme cold weather, but insulated boots are warmest.
- Not bulky, but can be heavy.
- Can be treated to be waterproof.
- Generally good traction.

Mukluks—store-bought

- There are several different types, the mukluks are as warm as the insulation in them, (e.g. USAF mukluks).
- Bulky, but usually lightweight.
- May be treated to be waterproof, depending on materials used in the boots.
- Good traction.

Mukluks—skin

- Good protection from wind, warmth is as good as the insulation in them.
- Can be bulky, but usually very lightweight.
- Repel some water.
- Poor traction.

Survival Gear

Air medical escorts should consider the possibility of an in-flight emergency and always carry survival gear somewhere on their person on all flights. More detail on this is found in Chapter 10, Surviving an In-Flight Emergency.

Air Medical Packs

Many medical personnel who often fly on air medical flights have an "air medical pack" ready to go at all times. Although not survival gear, it can help them feel more comfortable when they are not able to return home on schedule. They may want to bring:

- Extra clothing.
- Some cash or a credit card.
- A passport.
- A toiletry kit (e.g. toothbrush, comb etc.).
- Any medications they require on a daily basis.

Some things that have prevented air medical crews from returning home immediately after flights have been:

- Poor weather.
- Mechanical trouble with the aircraft.
- The flight restrictions after September 11, 2001.
- Wild land fires with severe smoke conditions.
- Volcanic eruptions.

Summary

Performing the duties of the air medical escort is both rewarding and challenging. Air medical escorts must take care of their own needs, as well as assisting their patients. They should try to eat a healthy diet, avoid taking alcohol or drugs that could impair their work performance, and avoid flying when ill or during times when they are not at their physical peak (e.g. immediately after scuba diving or donating blood etc.). Wearing the correct safety gear also can minimize the chance of injury.

Notes